DOCUMENT RESUME

ED 105 794 95 HE 006 483

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TITLE A Survey of Continuing Education Opportunities Available to Nonacademic Scientists, Engineers, and Mathematicians. Higher Education Panel Reports, Number 23.
INSTITUTION American Council on Education, Washington, D.C. Higher Education Panel.
SPONS AGENCY National Institutes of Health (DHEW), Bethesda, Md.; National Science Foundation, Washington, D.C.; Office of Education (DHEW), Washington, D.C.
PUB DATE Apr 75
NOTE 34p.
AVAILABLE FROM Higher Education Panel, American Council on Education, One Dupont Circle, Washington, D.C. 20036

EDRS PRICE MF-$0.76 HC-$1.95 PLUS POSTAGE
DESCRIPTORS Educational Opportunities; *Engineers; *Higher Education; Mathematicians; *Professional Continuing Education; Questionnaires; Refresher Courses; *Scientists; *Surveys

ABSTRACT

During the fall of 1974, the Higher Education Panel of the American Council on Education conducted a survey of continuing education opportunities available to professional scientists, engineers, and mathematicians who are employed full-time in industry and government. The survey sought to gain information on the nature and extent of offerings available within the higher education community by which people employed in science fields could increase and update their professional knowledge and skills, whether in their present or related career fields. The survey results offer specific information on the type and number of offerings currently available, approximate enrollments, type of faculty and modes of instruction utilized, and the distribution of such offerings among institutions of higher education. From a total of 215 institutions reporting, 152 (70.7 percent) had appropriate offerings at their institutions. In general, public institutions accounted for about two-thirds of such offerings. Almost all appropriate continuing education activity was concentrated among doctorate-granting institutions. An institution's regular faculty provided the bulk of the institutional staff, although supplemented to a considerable extent by the use of guest speakers. Statistical tables accompany the text. The appendixes include the questionnaire and survey procedures. (Author/PG)

ED105794

A Survey of Continuing Education Opportunities Available to Nonacademic Scientists, Engineers, and Mathematicians

Elaine H. El-Khawas and Joan L. Kinzer

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HE 006 483

HIGHER EDUCATION PANEL REPORTS, NUMBER 23
AMERICAN COUNCIL ON EDUCATION

APRIL
1975

A Survey Funded by the National Science Foundation, the U. S. Office of Education, and the National Institutes of Health.

AMERICAN COUNCIL ON EDUCATION

Roger W. Heyns, *President*

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The Higher Education Panel is a survey research program established by the Council for the purpose of securing policy-related information quickly from representative samples of colleges and universities. *Higher Education Panel Reports* are designed to expedite communication of the Panel's survey findings to policy-makers in government, in the associations, and in educational institutions across the nation.

The Higher Education Panel's surveys on behalf of the Federal Government are conducted under grant support provided jointly by the National Science Foundation, the National Institutes of Health, and the U.S. Office of Education (NSF Grant GR-99).

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Number 23 April 1975

American Council on Education
Washington, D.C.

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A Survey of Continuing Education Opportunities Available to Nonacademic Scientists, Engineers, and Mathematicians

Elaine H. El-Khawas and Joan L. Kinzer

During the fall of 1974, the Higher Education Panel conducted a survey of continuing education opportunities available to professional scientists, engineers, and mathematicians who are employed full-time in industry and government. Conducted at the request of the National Science Foundation, the survey sought to gain baseline information on the nature and extent of offerings available within the higher education community by which people employed in science fields could increase and update their professional knowledge and skills, whether in their present or related career fields. (For convenience, such offerings will be referred to hereafter as "appropriate" or "suitable" offerings.) The survey results offer specific information on the number and type of offerings currently available, approximate enrollments, type of faculty and modes of instruction utilized, and the distribution of such offerings among institutions of higher education.

Nature of the Survey

The survey questionnaire was mailed to 284 colleges and universities, comprising those members of the Higher Education Panel that granted master's or higher degrees in science and engineering fields during 1970-71.[1] Usable responses were received from 215 institutions (or 76 percent). In Part I of the questionnaire, institutions were asked whether they had any continuing education offerings suitable for employed professionals in the designated science fields and, if so, how many different types of institutional units (regular graduate or undergraduate programs, continuing education centers, evening schools or extension divisions) presented such offerings. Part II, requir-

[1] As determined by the 1970-71 Survey of Earned Degrees Conferred (U.S. Office of Education, Washington, D.C.).

ing specific information on the offerings, was to be completed only in terms of the institution's specially constituted continuing education centers, evening schools, or extension divisions. Further information on survey procedures can be found in Appendix A. A copy of the complete questionnaire is provided in Appendix B.

Of the total number of respondents, 63 institutions (29.3 percent) currently provided no offerings appropriate for the continuing education of scientists, engineers, or mathematicians. Fifty of these were private institutions; most did not offer the doctorate degree.

In all, 152 institutions (70.7 percent) reported that they did have continuing education offerings appropriate to the survey's purposes. Of these, 70 percent were public institutions and 87 percent offered a doctorate degree in science and engineering. Tables 1 and 2 show the range of units through which these 152 institutions provided their continuing education offerings.

Data in Tables 3 through 10 are based on responses to Part II of the questionnaire. Institutions provided specific information on the offerings made available within each of their continuing education units, evening schools, and/or extension divisions. In all, 133 institutions[2] provided information on the offerings of 182 specialized units.

In interpreting the data in Tables 3 through 10, the restricted scope of the survey should be kept in mind. Appropriate offerings, for example, included only those suitable for the continuing education needs of nonacademic scientists, engineers, and mathematicians who already hold baccalaureate degrees. Detailed information was reported only for appropriate offerings

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[2]Nineteen of the 152 institutions provided continuing education offerings only as part of their regular programs. In accordance with survey instructions, these institutions did not complete Part II of the questionnaire.

provided within continuing education centers and evening or extension divisions; the tabulations therefore do not include information on offerings made available as part of regular graduate or undergraduate programs. Furthermore, survey institutions were restricted to colleges and universities that granted master's or higher degrees in sciences and engineering. These restrictions were imposed in an attempt to gain an accurate picture of a defined segment of continuing education.

Overview of Findings

The accompanying tables provide specific information on the nature and extent of opportunities currently available within the higher education community that might be suitable to the continuing education needs of nonacademic scientists, engineers, and mathematicians. As will be noted, counts of institutions and of the number of separate units are frequently provided along with counts of approximate enrollments or total number of offerings. Similarly, most tables include figures on "percent of all respondents"; these figures, based on all 215 respondents to the survey (including 63 with no appropriate offerings) are shown to provide indications of the general extent of continuing education activity for scientists, engineers, and mathematicians currently available within higher education institutions.

Extent of Continuing Education Offerings

•A majority of responding institutions (70.7 percent) currently offered continuing education opportunities appropriate to the survey's purpose (Table 1). More than two-thirds were public institutions and 87 percent were doctorate-granting institutions.

Type of Unit Offering Continuing Education Opportunities

•Appropriate continuing education opportunities were available within a variety of institutional structures (Table 1). About 37 percent of the

institutions reported that appropriate offerings were available within regular graduate programs.

Appropriate offerings were frequently available within continuing education units, both within general-purpose centers (at 29.8 percent of institutions) and within those with a specific focus (21.4 percent of institutions).

•Continuing education opportunities were more widely available at public than at private institutions.

Among public institutions, regular graduate programs provided appropriate offerings at 40.3 percent of these institutions (Table 1). General-purpose continuing education centers were mentioned almost as frequently (37 percent). Specific-focus centers (e.g., continuing engineering education) were mentioned by 22.7 percent of public institutions. Uniquely for public institutions, 40 percent indicated that appropriate offerings were available as part of extension programs.

Among private institutions, more than half reported that they had no appropriate offerings (Table 1). Of the others, most included continuing education opportunities as part of regular graduate or undergraduate programs. Only a few provided such opportunities through continuing education centers or evening programs.

Total Number of Units With Appropriate Offerings

•Appropriate continuing education offerings were available within a total of 755 separate institutional units (Table 2).[3] Two-thirds of these, however, were regular program units. A total of 144 continuing education centers were reported to have appropriate offerings, 65 of which had specific-focus programs.

Public institutions accounted for two-thirds of all units reported. Among private institutions, a total of 49 continuing education centers were reported, 28 with specific programs.

•Only a small proportion of institutions reported having more than one unit of a given type.

Multiple units were most frequently reported for regular program units. Of institutions with continuing education offerings within regular graduate or undergraduate units, more than half reported having two or more such units with appropriate offerings.

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[3]These figures must be interpreted cautiously because some institutions counted their entire graduate or undergraduate program as one unit while others provided a count of the number of separate divisions or schools.

A pattern of one unit per institution was typical for continuing education centers, extension divisions, and evening schools. However, a third of institutions with specific-focus continuing education centers reported having two or more such units.

Total Offerings by Type and Discipline

For the 182 specially constituted units reported by 133 institutions, detailed information was obtained on the approximate number of offerings by type and discipline (Tables 3 and 4). In all, institutional estimates added to about 17,500 offerings (Table 3).[4] Two-thirds of this total were reported by public institutions. Fully 94 percent of the total were offered by Ph.D.-granting institutions.

The great majority of offerings (67.5 percent) were available as courses of conventional length, following a term, quarter, or academic-year format.

About one-fifth of all offerings were available as part of conferences, institutes, or special seminars. This was a rather prevalent institutional practice: fully as many institutions reported use of the conference format (n=105) as had reported use of conventional academic course structures (n=102).

Of all appropriate offerings currently available at responding institutions, the most prevalent discipline category offered was engineering. Notably, almost all of the 5,800 engineering offerings were reported by Ph.D.-granting institutions. Two-thirds of the total were available at public institutions (Table 4).

Courses in social, physical and life sciences were also frequently available. Offerings in these three disciplines, which together totalled 6,300, were heavily concentrated within public and Ph.D.-granting institutions.

In contrast, a total of only 924 courses offering instruction in management skills for scientists and/or engineers were available at 61 institutions (or 28.4 percent of all respondents). About two-thirds of these offerings were reported by public institutions; they were offered almost exclusively by institutions granting the doctorate in science and engineering.

Approximate Enrollments During 1973-74

Based on approximate figures provided by institutions, estimated total

[4] Because of differing rates of response to particular items, the figure for total number of offerings differs among tables 3, 4, and 6. The figure shown here is the highest reported estimate.

enrollment for appropriate continuing education offerings was 403,600.[5] Eighty percent of this enrollment was in public institutions; fully 97 percent of the total enrollment was reported by Ph.D.-granting institutions (Table 5).

The three disciplines reporting the largest enrollment estimates included engineering (132,300), life sciences (80,900), and social sciences (65,800). The lowest enrollment figure was reported for computer sciences (15,600).

Within each discipline, the pattern of most enrollment taking place at public and Ph.D.-granting institutions generally prevailed. Slight exceptions occurred with computer sciences and mathematics, for which about half and a third of total enrollment, respectively, was reported by private institutions.

Location of Offerings

•Of the total number of offerings available in special units of survey institutions, 80 percent were offered directly on the college or university campus. In all, campus offerings of relevance to the continuing education needs of employed scientists, engineers, and mathematicians were available at 59.1 percent of all responding institutions (Table 6).

Of other possible locations, use of the facilities of another educational institution (e.g., community college, high school) was reported by 20.9 percent of institutions. Similarly, courses held in industrial plants or offices were reported by 21.4 percent of institutions. For both types of settings however, only a small number of offerings were available.

Courses located within federal, state or local government offices were available to only a small extent, accounting for 479 offerings in all.

Modes of Instruction

•The most frequently utilized modes of instruction for continuing education offerings were classroom lectures, discussion groups, and laboratory work. Each of these techniques was reported in use by more than 100 of the 133 institutions providing information on their continuing education offerings (Table 7).

Other instructional modes mentioned by 50 or more institutions included use of movies and self-study, as well as use of videotape (62 institutions) and computer-assisted instruction (57 institutions). Use of audio-tape was reported by 44 institutions.

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[5]This is a count of enrollments, not of persons. Thus, one person enrolled in three separate courses during the year would be counted three times. Furthermore, all persons enrolled in the offerings, not just nonacademic scientists and engineers, were reported.

Number and Type of Instructional Staff

•The total instructional staff for appropriate continuing education offerings was estimated at 19,100. Of this total, just over half were regular faculty members at the institution (Table 8).

Guest speakers were frequently utilized for continuing education offerings. An estimated 4,800 speakers, or one-quarter of the total, were part of the instructional staff for these offerings during 1973-74.

Institutions estimated that a total of 2,800 adjunct faculty were utilized for continuing education offerings during the year. Notably, adjunct faculty were reported relatively more often by private institutions (where they represented one in five staff members) than by public institutions (with a representation of about one in eight).

Policy on Credit for Advanced Degrees

•Of the 133 institutions providing specific information, close to half indicated that their continuing education offerings were not creditable toward an advanced degree (Table 9).

•In all, 74 institutions reported that continuing education offerings were creditable toward an advanced degree. For 50 of these institutions, the highest degree for which credit could be earned was the master's degree; credit toward a doctorate degree was available at only 24 institutions.

Length of Time Appropriate Offerings Have Been Available

•Among the institutions reporting, continuing education offerings appropriate to the needs of employed scientists, engineers or mathematicians have typically been available for ten years or more (Table 10).

This situation was noted particularly for evening or extension divisions. Most general-purpose continuing education centers also have had appropriate offerings available for ten or more years, although a good number have had such offerings for shorter periods of time.

As a group, continuing education programs with a specific focus reported the most varied pattern for course availability. Although close to half have offered appropriate courses for at least ten years, more than a third have provided such offerings for five to ten years and another one-fifth have had appropriate offerings only in the last five years.

Conclusion

This survey documents the existence of a broad range of opportunities available within higher education institutions that are suitable for the continuing education needs of employed scientists, engineers, and mathematicians. From a total of 215 institutions reporting, 152 (70.7 percent) had appropriate offerings at their institution. In general, public institutions accounted for about two-thirds of such offerings. Almost all appropriate continuing education activity was concentrated among doctorate-granting institutions. In addition to offerings of separately organized continuing education units, regular graduate or undergraduate programs were a frequent setting in which appropriate offerings were made available.

Of the 133 institutions providing specific information on 182 continuing education centers, evening or extension units, a total of approximately 17,500 course offerings -- with an estimated total enrollment of about 403,600 and an instructional staff of about 19,000 -- had been offered during 1973-74. The greatest number of offerings and the largest enrollments were reported for engineering; specialized offerings in computer sciences or in management for scientists and engineers were much less frequently available.

Appropriate offerings were located mainly within public institutions, typically right on the campus rather than in other locations, and for the most part followed the conventional academic model in terms of modes of instruction and calendar format. An institution's regular faculty provided the bulk of the instructional staff, although supplemented to a considerable extent by the use of guest speakers.

TABLES

Table 1

Number of Institutions and Component Units With Appropriate Continuing Education Offerings

Type Of Unit	All Institutions		Public Institutions		Private Institutions	
	Number	Percent Of All Respondents	Number	Percent Of All Respondents	Number	Percent Of All Respondents
Regular Undergraduate Units	62	28.8%	39	32.8%	23	24.0%
Regular Graduate Units	80	37.2%	48	40.3%	32	33.3%
Continuing Education Centers:						
General Purpose	64	29.8%	44	37.0%	20	20.8%
Specific Focus	46	21.4%	27	22.7%	19	19.8%
Evening Divisions or Schools	34	15.8%	21	17.6%	13	13.5%
Extension Divisions or Schools	51	23.7%	48	40.3%	3	3.1%
Total, Institutions With Any Appropriate Continuing Education Offerings	152	70.7%	106	89.1%	46	47.9%
Total, Institutions With No Appropriate Continuing Education Offerings	63	29.3%	13	10.9%	50	52.1%
Total Respondents	215	100.0%	119	100.0%	96	100.0%

Table 2

Number of Institutional Units With Continuing Education Offerings:
Total Reported and Distribution Among Institutions

Type of Unit	Total Number Of Units	Number Of Institutions	Number of Institutions Reporting Each Number of Units: 1	2	3	4	5	6/more
All Institutions (N=215)								
Regular Undergraduate Units	227	62	27	8	7	4	4	12
Regular Graduate Units	279	80	36	9	8	8	4	15
Continuing Education Centers:								
General Purpose	79	64	57	3	1	2	1	-
Specific Focus	65	46	31	12	2	1	-	-
Evening Divisions or Schools	49	34	30	3	-	-	-	1
Extension Divisions or Schools	56	51	47	3	1	-	-	-
Public Institutions (N=119)								
Regular Undergraduate Units	156	39	15	7	6	1	2	8
Regular Graduate Units	170	48	25	4	4	4	3	8
Continuing Education Centers:								
General Purpose	58	44	38	2	1	2	1	-
Specific Focus	37	27	18	8	1	-	-	-
Evening Divisions or Schools	35	21	18	2	-	-	-	1
Extension Divisions or Schools	51	48	45	3	-	-	-	-
Private Institutions (N=96)								
Regular Undergraduate Units	71	23	12	1	1	3	2	4
Regular Graduate Units	109	32	11	5	4	4	1	7
Continuing Education Centers:								
General Purpose	21	20	19	1	-	-	-	-
Specific Focus	28	19	13	4	1	1	-	-
Evening Divisions or Schools	14	13	12	1	-	-	-	-
Extension Divisions or Schools	5	3	2	-	1	-	-	-

Table 3

Continuing Education Offerings Available
by Type of Offering[a]

Type of Offering	Number of Offerings	Number Of Units	Number of Institutions	Percent of All Respondents[b]
All Institutions (N=133)				
Courses of academic year, semester or quarter length	11,796	122	102	47.4%
Short courses (less than a term in length)	1,747	88	78	36.3%
Conferences, institutes, seminars, etc.	3,446	121	105	48.8%
Other	486	14	14	6.5%
Total[c]	17,475	182	133	61.9%
Public Institutions (N=98)				
Courses of academic year, semester or quarter length	7,053	89	76	63.9%
Short courses (less than a term in length)	1,517	62	56	47.1%
Conferences, institutes, seminars, etc.	2,887	93	81	68.1%
Other	326	11	11	9.2%
Total	11,783	129	98	82.4%
Private Institutions (N=35)				
Courses of academic year, semester or quarter length	4,743	33	26	27.1%
Short courses (less than a term in length)	230	26	22	22.9%
Conferences, institutes, seminars, etc.	559	28	24	25.0%
Other	160	3	3	3.1%
Total	5,692	53	35	36.5%

Table 3 (con't)

Continuing Education Offerings Available
by Type of Offering[a]

Type of Offering	Number of Offerings	Number Of Units	Number of Institutions	Percent of All Respondents[b]
Ph.D. Granting Institutions (N=119)				
Courses of academic year, semester or quarter length	10,997	109	90	55.9%
Short courses (less than a term in length)	1,724	83	73	45.3%
Conferences, institutes, seminars, etc.	3,396	112	97	60.2%
Other	354	12	12	7.5%
Total	16,471	166	119	73.9%
Non-Ph.D. Granting Institutions (N=14)				
Courses of academic year, semester or quarter length	799	13	12	22.2%
Short courses (less than a term in length)	23	5	5	9.3%
Conferences, institutes, seminars, etc.	50	9	8	14.8%
Other	132	2	2	3.7%
Total	1,004	16	14	25.9%

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

[b]The figures for "percent of all respondents" are based on the following number of respondents to the survey: all institutions--215; public institutions--119; private institutions--96; Ph.D.-granting institutions--161; non-Ph.D.-granting institutions--54.

[c]Because of differing rates of responses to particular items, the figure for total number of offerings differ between tables 3, 4, and 6. The figure shown here is the highest reported estimate.

Table 4

Continuing Education Offerings Available
by Major Discipline[a]

Discipline Category	Number Of Offerings	Number Of Units	Number of Institutions	Percent of All Respondents[b]
All Institutions (N=133)				
Engineering	5,762	130	104	48.4%
Life Sciences	1,790	86	72	33.5%
Social Sciences	2,426	82	74	34.4%
Physical Sciences	2,081	101	89	41.4%
Mathematics	1,297	94	79	36.7%
Management for Scientists and/or Engineers	924	67	61	28.4%
Computer Sciences	838	87	69	32.1%
Other	1,159	36	35	16.3%
Total	16,277	183	133	61.9%
Public Institutions (N=98)				
Engineering	3,574	96	76	63.9%
Life Sciences	1,645	70	57	47.9%
Social Sciences	1,843	61	54	45.4%
Physical Sciences	1,465	74	65	54.6%
Mathematics	799	70	59	49.6%
Management for Scientists and/or Engineers	609	47	45	37.8%
Computer Sciences	518	60	47	39.5%
Other	1,102	26	25	21.0%
Total	11,555	129	98	82.4%
Private Institutions (N=35)				
Engineering	2,188	34	28	29.2%
Life Sciences	145	16	15	15.6%
Social Sciences	583	21	20	20.8%
Physical Sciences	616	27	24	25.0%
Mathematics	498	24	20	20.8%
Management for Scientists and/or Engineers	315	20	16	16.7%
Computer Sciences	320	27	22	22.9%
Other	57	10	10	10.4%
Total	4,722	54	35	36.5%

Table 4 (Con't)

Continuing Education Offerings Available
by Major Discipline[a]

Discipline Category	Number Of Offerings	Number Of Units	Number Of Institutions	Percent of All Respondents[b]
Ph.D.-Granting Institutions (N=119)				
Engineering	5,674	122	97	60.2%
Life Sciences	1,660	79	66	41.0%
Social Sciences	2,293	74	66	41.0%
Physical Sciences	1,839	90	79	49.1%
Mathematics	1,216	84	70	43.5%
Management for Scientists and/or Engineers	921	65	59	36.6%
Computer Sciences	775	79	62	38.5%
Other	1,137	33	32	19.9%
Total	15,515	167	119	73.9%
Non-Ph.D.-Granting Institutions (N=14)				
Engineering	88	8	7	13.0%
Life Sciences	130	7	6	11.1%
Social Sciences	133	8	8	14.8%
Physical Sciences	242	11	10	18.5%
Mathematics	81	10	9	16.7%
Management for Scientists and/or Engineers	3	2	2	3.7%
Computer Sciences	63	8	7	13.0%
Other	22	3	3	5.6%
Total	762	16	14	25.9%

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

[b]The figures for "percent of all respondents" are based on the following number of respondents to the survey: all institutions--215; public institutions--119; private institutions--96; Ph.D.-granting institutions--161; non-Ph.D.-granting institutions--54.

Table 5

Approximate Enrollments in Continuing Education Offerings by Major Discipline[a]

Discipline Category	Approximate Enrollment Number	Approximate Enrollment Percent	Number Of Units	Number of Institutions	Percent of All Respondents[b]
All Institutions (N=131)					
Engineering	132,303	32.8%	128	104	48.4%
Life Sciences	80,874	20.0%	82	69	32.1%
Social Sciences	65,736	16.3%	80	73	34.0%
Physical Sciences	45,138	11.2%	100	89	41.4%
Mathematics	21,161	5.2%	94	80	37.2%
Management for Scientists and/or Engineers	21,046	5.2%	64	60	27.9%
Computer Sciences	15,590	3.9%	84	68	31.6%
Other	21,773	5.3%	31	31	14.4%
Total	403,621	100.0%	179	131	60.9%
Public Institutions (N=96)					
Engineering	99,723	31.0%	93	75	63.0%
Life Sciences	78,214	24.3%	66	54	45.4%
Social Sciences	51,832	16.1%	58	52	43.7%
Physical Sciences	34,620	10.8%	72	64	53.8%
Mathematics	13,281	4.1%	69	59	49.6%
Management for Scientists and/or Engineers	15,268	4.8%	44	44	37.0%
Computer Sciences	8,761	2.7%	56	45	37.8%
Other	19,626	6.1%	23	23	19.3%
Total	321,325	100.0%	125	96	80.7%
Private Institutions (N=35)					
Engineering	32,580	39.6%	35	29	30.2%
Life Sciences	2,660	3.2%	16	15	15.6%
Social Sciences	13,904	16.9%	22	21	21.9%
Physical Sciences	10,518	12.8%	28	25	26.0%
Mathematics	7,880	9.6%	25	21	21.9%
Management for Scientists and/or Engineers	5,778	7.0%	20	16	16.7%
Computer Sciences	6,829	8.3%	28	23	24.0%
Other	2,147	2.6%	8	8	8.3%
Total	82,296	100.0%	54	35	36.5%

Table 5 (Con't)

Approximate Enrollments in Continuing Education Offerings
by Major Discipline[a]

Discipline Category	Approximate Enrollment		Number Of Units	Number of Institutions	Percent of All Respondents[b]
	Number	Percent			
Ph.D.-Granting Institutions (N=117)					
Engineering	131,410	33.6%	120	97	60.2%
Life Sciences	79,850	20.4%	76	64	39.8%
Social Sciences	64,042	16.3%	72	65	40.4%
Physical Sciences	40,364	10.3%	88	78	48.4%
Mathematics	19,007	4.8%	83	70	43.5%
Management for Scientists and/or Engineers	20,989	5.4%	62	58	36.0%
Computer Sciences	15,107	3.9%	76	61	37.9%
Other	21,282	5.4%	28	28	17.4%
Total	392,051	100.0%	163	117	72.7%
Non-Ph.D.-Granting Institutions (N=14)					
Engineering	893	7.7%	8	7	13.0%
Life Sciences	1,024	8.9%	6	5	9.3%
Social Sciences	1,694	14.6%	8	8	14.8%
Physical Sciences	4,774	41.3%	12	11	20.4%
Mathematics	2,154	18.6%	11	10	18.5%
Management for Scientists and/or Engineers	57	.5%	2	2	3.7%
Computer Sciences	483	4.2%	8	7	13.0%
Other	491	4.2%	3	3	5.6%
Total	11,570	100.0%	16	14	25.9%

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

[b]The figures for "percent of all respondents" are based on the following number of respondents to the survey: all institutions--215; public institutions--119; private institutions--96; Ph.D.-granting institutions--161; non-Ph.D.-granting institutions--54.

Table 6

Location of Continuing Education Offerings[a]

Location	Number Of Offerings	Percent Of Total	Number Of Units	Number Of Institutions	Percent Of All Respondents[b]
On Campus (including branch campus)	13,853	80.7%	162	127	59.1%
Another Educational Institution	872	5.1%	49	45	20.9%
Industrial Plant or Office	542	3.2%	51	46	21.4%
Federal Government Agency	339	2.0%	23	21	9.8%
State or Local Government Agency	140	0.8%	22	20	9.3%
Other	1,427	8.3%	54	48	22.3%
Total	17,173	100.0%	174	131	60.9%

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

[b]The figures for "percent of all respondents" are based on the following number of respondents to the survey: all institutions--215; public institutions--119; private institutions--96; Ph.D.-granting institutions--161; non-Ph.D.-granting institutions--54.

Table 7

Number of Institutions Utilizing Selected Modes of Instruction In Continuing Education Offerings[a]

Instructional Mode	All Institutions	Public Institutions	Private Institutions	Ph.D-Granting Institutions	Non-Ph.D. Granting Institutions
Classroom Lectures	131	96	35	117	14
Discussion Groups	126	93	33	114	12
Laboratory Work	107	79	28	94	13
Self-Study	60	44	16	54	6
Correspondence	9	8	1	9	-
Programmed Texts	26	18	8	24	2
Closed-Circuit Television	29	20	9	25	4
Movies	76	54	22	67	9
Videotape	62	49	13	57	5
Audiotape	44	33	11	37	7
Computer-Assisted Instruction	57	35	22	50	7
Electrowriter (blackboard by wire)	5	4	1	5	-
Other	18	13	5	17	1

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

Table 8

Number and Type of Instructional Staff
for Continuing Education Offerings[a]

Category	All Institutions	Public Institutions	Private Institutions	Ph.D-Granting Institutions	Non-Ph.D Granting Institutions
Regular Faculty	10,158	7,518	2,640	9,565	593
Adjunct Faculty	2,764	1,724	1,040	2,701	63
Guest Speakers	4,778	3,715	1,063	4,699	79
Other	1,351	1,119	232	1,349	2
Total	19,051	14,076	4,975	18,314	737

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

Table 9

Highest Degree Toward Which Credit For Continuing Education Offerings May Be Applied[a] (Number of Institutions)

Highest Degree	All Institutions	Public Institutions	Private Institutions	Ph.D.-Granting Institutions	Non-Ph.D. Granting Institutions
Offerings are not creditable toward an advanced degree	59	41	18	55	4
Offerings are creditable toward:					
Master's Degree	50	43	7	40	10
Doctorate Degree	24	14	10	24	0
Total	133	98	35	119	14

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

Table 10

Length of Time Continuing Education Offerings Have Been Available for Scientists, Engineers, and/or Mathematicians[a] (Number of Units)

Type of Unit	Number Of Units	Number of Units Reporting: Less Than Five Years	Between 5 and 10 years	Ten Years or More
All Institutions				
Continuing Education Centers:				
General Purpose	66	13	13	40
Specific Focus	49	10	18	21
Evening Divisions or Schools	16	1	1	14
Extension Divisions or Schools	43	2	9	32
Other Units	5	2	-	3
Total, Number of Units	179	28	41	110
Percentage	100.0	15.6	22.9	61.4
Public Institutions				
Continuing Education Centers:				
General Purpose	47	9	10	28
Specific Focus	28	4	12	12
Evening Divisions or Schools	8	1	-	7
Extension Divisions or Schools	42	2	9	31
Other Units	3	2	-	1
Total, Number of Units	128	18	31	79
Percentage	100.0	14.0	24.2	61.7
Private Institutions				
Continuing Education Centers:				
General Purpose	19	4	3	12
Specific Focus	21	6	6	9
Evening Divisions or Schools	8	-	1	7
Extension Divisions or Schools	1	-	-	1
Other Units	2	-	-	2
Total, Number of Units	51	10	10	31
Percentage	100.0	19.6	19.6	60.8
Ph.D.-Granting Institutions				
Continuing Education Centers:				
General Purpose	60	10	13	37
Specific Focus	46	10	16	20
Evening Divisions or Schools	13	1	-	12
Extension Divisions or Schools	39	2	9	28
Other Units	5	2	-	3
Total, Number of Units	163	25	38	100
Percentage	100.0	15.3	23.3	61.0
Non-Ph.D.-Granting Institutions				
Continuing Education Centers:				
General Purpose	6	3	-	3
Specific Focus	3	-	2	1
Evening Divisions or Schools	3	-	1	1
Extension Divisions or Schools	3	-	-	4
Other Units	-	-	-	-
Total, Number of Units	16	3	3	10
Percentage	100.0	18.8	18.8	62.5

[a]This table reports data only on offerings made available through continuing education centers, evening divisions, or extension units (and not as a part of regular graduate or undergraduate programs).

Appendix A

Survey Procedures

Survey Procedures

This survey was conducted as part of the continuing research program of the Higher Education Panel, a survey mechanism established at the American Council on Education in 1971 for the purpose of conducting small-scale surveys on higher education topics of current policy interest. The Panel is based on a network of campus representatives at 644 institutions broadly representative of all colleges and universities in the United States. For a given survey, all member institutions or an appropriate subset might be selected for study.

Because of the varied nature of continuing education activity and because little previous information on particular offerings was available, a pretest was conducted among 20 institutions. For twelve of these institutions, the doctorate was their highest degree offering, while three others had the master's as their highest offering, and five offered no degree beyond the baccalaureate.

The eighteen institutions that replied by the time of the pretest deadline offered many extremely helpful suggestions and comments on the draft questionnaire. In particular, pretest institutions pointed out the difficulties of reporting detailed information about those offerings that were available as part of their regular graduate or undergraduate programs. As a result, the final survey requested detailed information only for special units (continuing education centers, evening divisions, etc.). On Part I of the final questionnaire, however, it was still possible to gather information on the total number and range of settings within institutions where appropriate continuing education offerings were available.

Because none of the five pretest institutions with a baccalaureate as their highest degree reported any continuing education activity appropriate to the survey's purposes, it was also decided that the final survey would be limited to those who offered at least a master's degree in science and engineering. In fact, as the survey results have shown, most appropriate offerings appear to be concentrated among doctorate-granting institutions.

Among the 644 members of the Higher Education Panel, there were 284 institutions that fit the criterion of offering a master's or higher degree in science and engineering. Questionnaires were sent to these institutions during September and October, 1974. Of these institutions, 70 percent were Ph.D.-granting, and 55 percent were public institutions.

Completed survey questionnaires were received from 215 institutions (76 percent). Three-quarters were doctorate-granting and 55 percent were public institutions, proportions roughly paralleling those for the entire set of survey institutions. In interpreting the data, however, it should be remembered that respondents were somewhat more likely to be doctorate-granting than were survey institutions in general.

Data shown in the report tabulations represent aggregated totals (unweighted) of the results given by institutions. Most tabulations report data separately for public and private institutions and for those institutions offering the doctorate in science and engineering and those offering a master's as their highest degree offering in these fields. Most of the analysis has focused on the number of institutions responding to the survey; in general, tabulations also show the number of separate units on which the data are based.

Appendix B

Survey Questionnaire

(Parts I &II)

AMERICAN COUNCIL ON EDUCATION
Higher Education Panel Survey Number 23

OMB No. 99-R0265. Exp. 6/75

SURVEY OF CONTINUING EDUCATION OPPORTUNITIES AVAILABLE TO SCIENTISTS, ENGINEERS, AND MATHEMATICIANS
Part I - Institutional Form

The purpose of this survey is to gain information about continuing education opportunities suitable for professional scientists, engineers, mathematicians, technicians and/or technologists who are employed full-time in industry and government. More specifically, we hope to: (a) gain a sense of the range of opportunities available to these employed professionals at a sample of colleges and universities and (b) obtain some descriptive information about offerings available through units designed for continuing education purposes. (Please refer to Part II for a description of types of offerings and fields of interest.)

Continuing education opportunities, for the purpose of this survey, refer to any offerings suitable for increasing and updating the professional knowledge and/or skills of employed scientists, engineers, mathematicians, and/or technicians who already hold at least a bachelor's degree (or the equivalent).

Appropriate offerings may or may not result in degree credits or certificates and may include conferences, workshops, symposia, etc., as well as formal courses. Specifically excluded for the purposes of this survey, however, are offerings designed primarily for practicing physicians, other health professionals, elementary and secondary school teachers, or college and university faculty.

For your institution as a whole, please complete the following information:

1. Does your institution have any offerings appropriate for the continuing education of professional scientists, engineers, and/or mathematicians?

   Yes ___
   No ___ (If no, please skip to Question #3 and return this form)

2. Please indicate how many of the following types of units, divisions, or centers offer such opportunities (For example, regular graduate units--3; evening divisions--1.)

Type of Unit	No. of Units with Appropriate Offerings
Regular Undergraduate Unit(s)	_____
Regular Graduate Unit(s)	_____
*Continuing Education Center(s), general purpose	_____*
*Continuing Education Center(s), specific focus (e.g. engineering education)	_____*
*Evening Division(s), school(s)	_____*
*Extension Division(s), school(s) (excluding agriculture extension)	_____*

PLEASE COMPLETE PART II (YELLOW FORM) FOR EACH UNIT IN THE CATEGORIES ABOVE THAT HAVE BEEN MARKED WITH AN ASTERISK. If you have any questions, please call us for clarification (at 202-833-4757).

3. Person completing this form: _____
   Office: _____
   Phone: _____

Thank you for your assistance.
Please return all applicable forms by November 4th.

TO: HIGHER EDUCATION PANEL
AMERICAN COUNCIL ON EDUCATION
ONE DUPONT CIRCLE
WASHINGTON, D.C. 20036

SURVEY OF CONTINUING EDUCATION OPPORTUNITIES
AVAILABLE TO SCIENTISTS, ENGINEERS, AND MATHEMATICIANS
Part II - To Be Completed By Continuing Education Centers,
Evening Divisions, and Extension Divisions

OMB. No. 99-R0265.
Exp. 6/75

UNIT NAME: _____ Person Completing Form _____

Phone _____

The purpose of this survey, conducted at the request of the National Science Foundation, is to gain information on continuing education opportunities suitable for scientists, engineers, mathematicians, technicians, and/or technologists employed full-time in industry and government (federal, state, and local). Please complete the following questions only in terms of the offerings of this unit that are appropriate for updating the knowledge and/or skills of employed professionals in these fields who hold at least a bachelor's degree (or the equivalent).

Appropriate offerings may or may not result in degree credits or certificates and may include conferences, workshops, symposia, etc., as well as formal courses. Please do not include offerings designed primarily for practicing physicians, other health professionals, elementary and secondary school teachers, or college and university faculty.

Where precise data are not available, we hope you would provide "best estimates".

---

1. Approximately how many offerings (as defined above) were actually presented during 1973-74 (including summer of 1974) in each of the following categories? (Report the sum of offerings even though certain offerings may have been presented more than once.)

	Number of Offerings
a. Courses of academic year, semester, or quarter length	_____
b. Short courses (of length shorter than that of a semester or quarter)	_____
c. Conferences, institutes, seminars, workshops, symposia	_____
d. Other (please specify): _____	_____
TOTAL	_____

2. Of this total number of offerings, approximately how many were in each of the following disciplines and what were the approximate enrollments? (Report the sum of enrollments even though students may have been enrolled in more than one course.)

	Number Of Offerings	Approximate Enrollment
a. Physical Sciences (such as physics, chemistry, geology, astronomy, or interdisciplinary areas involving combinations of these)	_____	_____
b. Life Sciences (including biochemistry, agriculture, forestry)	_____	_____
c. Social or Behavioral Sciences (excluding history or social work)	_____	_____
d. Engineering	_____	_____
e. Mathematics (including statistics)	_____	_____
f. Computer Science	_____	_____
g. Management for scientists and/or engineers (do not include general offerings in management or business administration)	_____	_____
h. Other (please specify): _____	_____	_____
TOTAL (The number of offerings, to the extent possible, should equal the total in question #1)	_____	_____

3. Approximately how many of these offerings were given:

	Number
a. On campus (including branch campuses)	_____
b. At another educational institution	_____
c. At an industrial plant or office location	_____
d. At a federal government agency	_____
e. At a state or local government agency	_____
f. At some other location (please specify): _____	_____
TOTAL (This total, to the extent possible, should equal the total in questions #1 and #2)	_____

4. What modes of instruction were used for these offerings? (Check all that apply)

____a. Classroom lectures
____b. Discussion groups
____c. Laboratory work
____d. Self-study
____e. Correspondence
____f. Programmed texts
____g. Closed-circuit television
____h. Movies
____i. Videotape
____j. Audiotape
____k. Computer-assisted instruction
____l. Electrowriter (blackboard by wire)
____m. Other (please specify);_____

5. Please estimate the number of persons in each of the following categories who served as instructional staff for these offerings during 1973-74 (including summer, 1974).

	Number		Number
Regular faculty	_____	Guest speakers	_____
Adjunct faculty	_____	Others (please specify): _____	_____

6. Were any of these offerings creditable towards an advanced degree at this institution?

_____No
_____Yes If yes, please indicate the degrees towards which credit may be applied:

7. How long has this unit offered continuing education courses for professional scientists, engineers, and/or mathematicians? (Check only one)

_____a. 10 years or more _____b. Between 5-10 years _____c. Less than 5 years

8. Would you like to be on a complimentary mailing list to receive from the National Science Foundation materials on continuing education of scientists, engineers, and/or mathematicians?

_____Yes _____No

If yes, please provide the name, title and mailing address of the director of this unit and anyone else that would be interested in receiving these materials

NAME_____TITLE_____

ADDRESS_____

_____ZIP_____

Please return this form by November 4th. Thank you for your assistance.